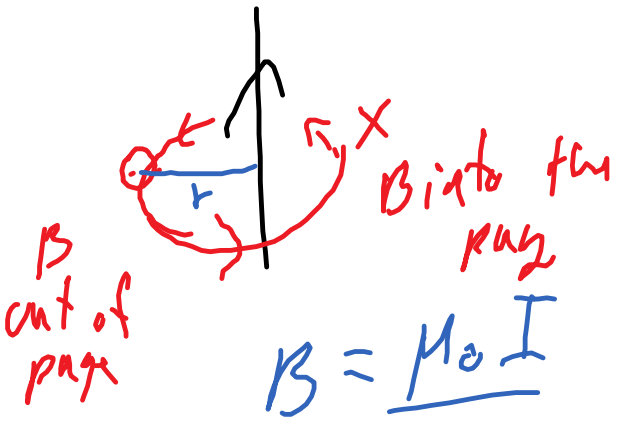
Topic
Particles in magnetic and electric fields
prep for CRT lab next class

Recap:
What is a magnetic field?
direction of field shows the direction a compass will point at that point.
Go from North to South of a permanent magnet.
around a wire the field lines go in circles following our first right hand rule



$$B = \frac{\mu_0 I}{2\pi r}$$

$\mu_0 = 4\pi \times 10^{-7} \frac{Tm}{A}$

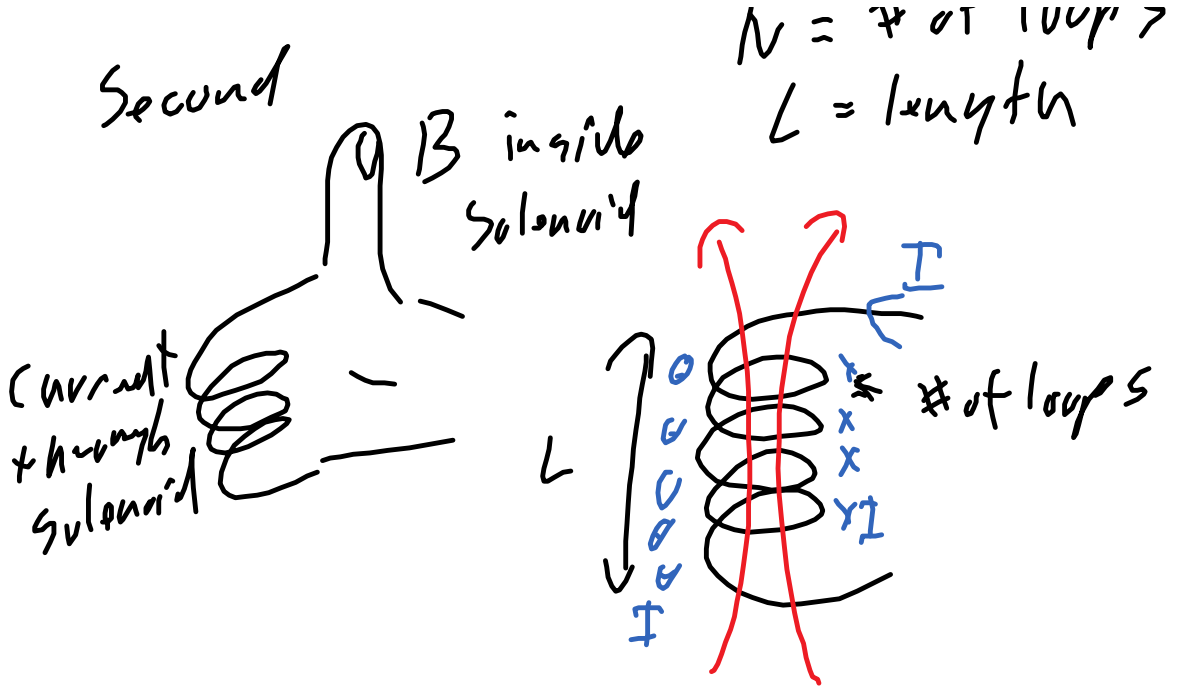
Tesla, $T = \frac{N}{Am}$

Solenoid - stronger magnetic field

$$B = \mu_0 \frac{N}{L} I$$

N = # of loops

Second



Moving charges (current in a wire or moving charge) experience a force.

$F_B = BIL \sin\theta = qvB\sin\theta$

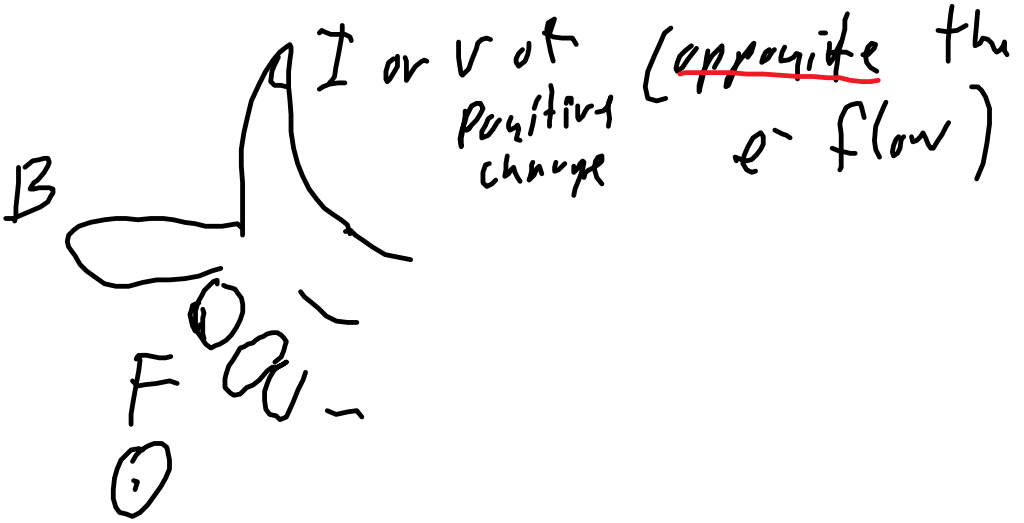
L is the length of the wire perpendicular to the field, B. θ is the angle between L and B

v is the velocity of the moving charge, q.

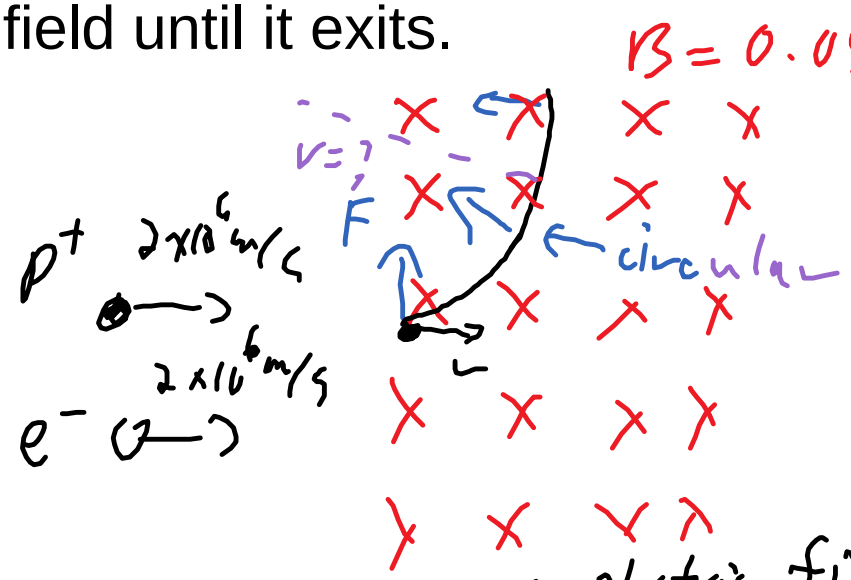
θ is the angle between v and B

(vector cross product - multiply 2 vectors and get a vector perpendicular to the first 2)

Third Right hand rule:



An electron and proton moving at 2.0 x 10^6m/s enter a magnetic field as shown in diagram below. If the magnetic field strength is 0.050T, draw the path of each particle from entering the field until it exits.



$e = 1.6 \times 10^{-19}$ C

$m_p = 1.67 \times 10^{-27}$ kg

$m_e = 9.11 \times 10^{-31}$ kg

b) what E (size + direction) would allow the particles to go straight through the B-field? ← electric field

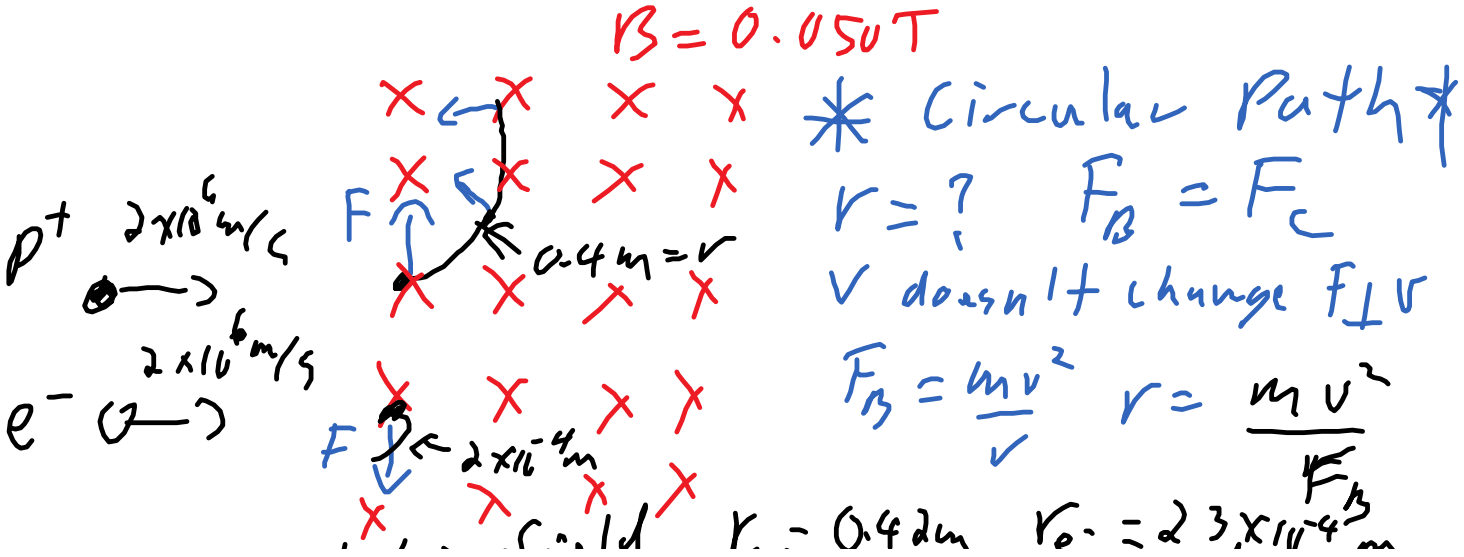
c) how would your answer to a change if the particles had a v component into the page as well as sideways?

p533 Q1-13 odds
p534 Q23, 25, 33, 35, 37, 41, 56, 59
Read labs: p75-79, 93-97
2 graphs, D vs Vd and D vs I

2 observations - observe D changing with Va with large E field (Vd) and large B field (I)
Hand in Observations with 2 graphs

An electron and proton moving at 2.0 x 10^6m/s enter a magnetic field as shown in diagram below. If the magnetic field strength is 0.050T, draw the path of each particle from entering the field until it exits.

$$F_B = qvB = 1.6\times10^{-19}(2\times10^6)(0.05)$$
$$= 1.6\times10^{-14}\ N$$



b) what E (size + direction) would allow the particles to go straight through the B-field? $F_B = F_e$ ↗ $E = vB$

$qvB = qE$

$E = 1.0 \times 10^5$ N/C

– E down the page

c) how would your answer to a change if the particles had a v component into the page as well as sideways?